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THE MASSASAUGA AND ITS HABITS.

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NOTWITHSTANDING the almost universal dislike entertained by people for snakes, the horror even that the sight of them excites in some minds, and the low value generally placed on ophidian intelligence, the more unprejudiced attention that has been bestowed by a few persons on these animals within recent years has shown that there is, after all, much to be said in their favor. Their lithe forms, their active and graceful movements, and their frequently brilliant and variegated colors, would at all times have rendered them attractive objects had not the possession of these qualities been more than offset by the actual or supposed possession of others of a disagreeable or dangerous nature. A closer acquaintance with snakes dispels many of our old prejudices against them, as being animals degraded in structure, malicious in disposition, and as laboring under a special curse; and presents them to us as possessors of many singular adaptations to their environment, many sagacious habits relating to the preservation of themselves and of their young, and sometimes of considerable conjugal and parental affection; and, by inference, enjoying as much of the favor of Heaven as most animals. That very interesting work by Miss C. C. Hopley, entitled "Snakes; Curiosities and Wonders of Serpent Life," will doubtless do much to remove unreasonable prepossessions against these persecuted animals, and to awaken greater interest in them and their ways. When we have learned more about them, we may discover that He who "spake with *authority*" also spake as having knowledge of nature when He used the words, "as wise as a serpent."

At present far too little is known concerning the life-history of the great majority of our snakes. Of the breeding habits of many species and large groups of species we know little or nothing, and it is to be desired therefore that accurate observations should be made and reported. I hope in this paper to contribute something to the knowledge of the Prairie Rattlesnake, or Massasauga (*Caudisona tergemina*).

This venomous serpent ranges from Ohio to Utah. Towards the north it extends into Michigan, Wisconsin, and to the Yellowstone River. It has also been found in Georgia and in Mississippi; but it appears to be replaced in the greater part of the South by *Caudisona miliaria.* Its general color above is from gray to brown, with seven rows of dark spots which have a light margin. The belly is mottled with black and yellowish. In Ohio and some parts of Indiana black specimens are sometimes found, and to these the name "Black Massasauga" has been given. Specimens of these were described by Holbrook as *Crotalophorus kirtlandii* in honor of Dr. J. P. Kirtland, their discoverer. Professor S. F. Baird also regarded this form as a distinct species; but of late herpetologists are not inclined to consider it as worthy of even varietal distinction. That the spotted form is ever found in wooded lands I do not know; but the black form, both in Ohio and Indiana, lives in swampy lands which are overgrown with brush, weeds, and coarse grass, and not on the open prairies.

Some of Dr. Kirtland's statements concerning the Black Massasauga are, I think, to be taken with some grains of allowance. With reference to its bite he has, it appears, asserted that its virulence is scarcely greater than that of the sting of a hornet. There are probably no differences, as respects virulence, between this snake and the more common pale and spotted form living on the open prairies, and where the latter is best known it is much feared; and certainly the effects of its bite on the large domestic animals are very serious. The members of this species are probably as poisonous as are individuals of equal size belonging to any of the other species; and since specimens of the Massasauga frequently attain a length of two feet and more, one of them would probably be equivalent in virulence to a whole colony of hornets.

Some twenty-five or thirty years ago this species was excessively abundant on the then sparsely-settled prairies of Northern Illinois; and among the farmers' boys of that day the slaughter of these snakes furnished a means for establishing a reputation for courage and enterprise. As more and more of the land came under cultivation, these serpents rapidly disappeared; so that, where they were once so numerous, they have scarcely been seen for perhaps twenty years. The reasons for this rapid extinction are, I think, not clear. Men, hogs, deer, and the larger wild fowl are regarded as the principal enemies of the Crotalidæ. Of course every man and boy attacked and killed every rattlesnake that was seen; but so likewise they did with every harmless snake; and the species of the latter have not usually suffered to the same extent as the rattlesnakes.

The members of the hog family are the foes of the venomous, and perhaps also of the non-venomous, serpents; but in the districts to which I refer the production of wheat, oats, and corn was at that time so exclusively pursued that but few hogs were raised, and these few were kept shut up in close pens, and thus prevented from exercising any influence on the reptilian fauna. Of their other enemies, the deer were early exterminated, and the native large wild birds, which may possibly have been addicted to devouring the young snakes, were by the "murdering guns" soon greatly reduced in numbers. That the mere disturbance of the soil in cultivation would be more prejudicial to the welfare of the rattlesnakes than to that of other species of serpents we do not know. Possibly, being heavy and clumsy animals, they would find it difficult to move about over cultivated fields and pursue there their vocation, and would abandon them. In this connection it might be profitable to study the influence of similar changes of environment on the Heterodons. It appears to me quite probable, however, that as the country became more thickly settled, the rattlesnakes were deprived to a considerable extent of their opportunities for securing food. In primitive times the prairies were the breeding-grounds of great numbers of prairie-hens (*Cupidonia cupido*) and other ground-nesting birds, whose young and possibly also eggs contributed largely to the support of the various species of snakes. The cultivation of the land interfered greatly with the breeding of these birds, and the prairie-hens were soon thinned out by the hunters, and thus the resources of the venomous snakes were greatly reduced.

The assertion that the sound of the rattle of the Massasauga is so feeble that it is scarcely audible is certainly incorrect. From experience I know that it can be heard at a distance of several feet.

The purpose of the rattle of the Crotalidæ has exercised the ingenuity of many minds and called forth many conjectures. The old notion that it was intended as a means of preserving man from the bite of the snake does not meet the requirements of the case. The organs of animals and plants are designed for the benefit of their possessors, and not for the benefit of some other organism. The somewhat close resemblance of the whirr of the rattle to the song of some grasshoppers has suggested to some one the idea that it is produced in order to lure within reach of the snake some of the grasshopper-eating birds. This hypothesis seems to lack the necessary basis of observation. No one probably has yet heard hungry rattlesnakes in imprisonment sounding the rattle in the vain hope of securing food. Nor is there any more evidence to prove that it is of use in bringing the sexes together. The anal scent-glands would seem to be far more efficient for that purpose. The sexes once together, it is quite possible that their emotions may be expressed by the low humming of the rattle that has been observed. Mr. Darwin concluded that the crepitation produced by the organ is used to frighten away the many birds and beasts that are liable to attack the snake. The means adopted to produce this result ought, then, to be regarded as a signal failure, for no man, or hog, or deer, or ravenous bird, that had resolved to attack a serpent, would probably be deterred therefrom by such impotent demonstrations. If the inspiration of fear were their purpose, we might expect the serpent to elevate itself like the cobra, or make other threatening movements, whereas the rattlesnake lies almost motionless in a coil, meanwhile sounding its rattle, a model of repose born of a consciousness of the possession of reserve power.

The opinion that is generally held that the rattle is sounded as a warning to some enemy which the snake has reason to fear is, I think, the correct one, notwithstanding all that has been said against it. Dr. Elliott Coues has concluded that "the actual result of its use as a menace in self-defence is the reverse of beneficial to the serpent, since the sound serves to direct and provoke attack from all the enemies which the animal has reason to fear." We are led to wonder how the rattlesnakes have been enabled to maintain themselves in the struggle for existence. In spite of the possession of this organ, thus pronounced to be of no use to them, and constantly betraying them into the hands of their enemies, the rattlesnakes have succeeded in diffusing themselves over most of the western hemisphere, in adapting themselves to many varied conditions, and in producing many species and an excessive number of individuals. On the other hand, the Copperheads and Cottonmouths, in possession of all the advantages enjoyed by the rattlesnakes in the way of poison-glands and fangs and relieved of the so-called disadvantage of the rattle, have neither extended their range so widely, nor developed into so many species, nor perhaps become so abundant in individuals.

Nothing can be more certain than the fact that the rattle is used chiefly when the snake is alarmed or angry. The whirr then serves to warn an approaching enemy that it is coming into collision with a rattlesnake, and not with something else. This is done for the special benefit of the snake. It is not benevolent, but intensely selfish. It is evidently extremely solicitous for its precious store of poison and its battery of fangs, without which it would fare slenderly in its endeavors to get a living; and if it can induce its antagonist to withdraw, the snake will have saved its stores and have escaped other possible results of a pitched battle. This warning must have been very efficient with most animals. In the eastern United States there were no native species of the hog tribe to devour snakes. To what extent deer are accustomed to destroy rattlesnakes we do not know. It appears to me that the rattlesnakes had more to fear from the numerous buffaloes that roamed over the greater part of the continent than from any animals that made direct war on them. The serpents must have been in frequent danger of being trodden upon by these, and to have attempted a war on a herd of large animals would have been useless. But through the simple device of sounding the rattle, each animal as it approached would be warned of the presence of the snake and would probably be induced to give it abundant space. Thus the poison might be reserved for such as could not take a hint. Doubtless, too, by this means, the snake was saved from many a rude tread by bear, or wolf, or panther, that to the serpent would at least have been very unpleasant, and might have involved it in a fight in which it had everything to lose and nothing to gain.

Within the past few weeks some specimens of the Massasauga have come under my notice, whose history may throw some light on the breeding habits of this species, as well as on some other matters that have been discussed. These specimens belonged to the black variety, and were captured in the northern part of Hendricks County, Indiana, by Mr. M. B. Harvey, of Rainstown. This gentleman's truthfulness is testified to by friends in whom I have complete confidence, and his statements are made with such sincerity and carefulness that I have no hesitation whatever in accepting them.

The specimens, two in number, one about two feet long, the other somewhat less, both dull black without trace of spots above, were captured about the 1st of last August and kept in close confinement. They were found in an old swampy clearing that was somewhat overgrown with brush. About the 1st of September they both brought forth living young,—one five and the other six,—the two broods appearing within thirty or forty hours of each other. Two of the young died when about three weeks old; the others are still alive (January 28) and in apparent health. Neither the parents since their capture nor the young since their birth had had, up to January 1, anything either to eat or to drink. About the latter date the corner of the box containing them was put into a vessel of water, and one old one and one young one partook. With this exception none have had either food or water up to the present time. Mr. Harvey states that at first the young were but three or four inches long. Some of them are now at least ten inches long, as I know from observation. Others are somewhat smaller. How can this growth have been made? It is possible, I think, that the gentleman has been somewhat mistaken as to the original size; or some of them may have been that small, while others not specially observed were larger. A specimen of the light-colored variety in my possession, which was taken from the mother but which had the fangs developed, measures, when outstretched, five and a half inches. It was hardened in alcohol while spirally twisted within the egg-membranes, and would when born probably have been somewhat longer. However, it is quite evident that Mr. Harvey's specimens have made some growth. Having at hand another alcoholic specimen, seven and a half inches long, which probably had not long been born at the time of its capture, and observing in the posterior portion of its body a hard lump, it occurred to me to open the abdomen and see what the young snake had eaten. The whole intestine was empty, and the hard lump consisted of an elongated mass of egg-yolk two and a half inches long and about three-eighths of an inch in diameter. On such a store of highly-nutritious materials doubtless the young are accustomed to subsist and grow until they are able to capture their own food.

The question whether or not the young ever enter the mother's mouth and stomach for refuge from danger and are permitted to come forth again has been much discussed. It would seem that the results of Mr. Goode's inquiries ought to have settled the question, but there are still many sceptical persons. In the issue of *Nature* for December 24; 1885, a writer, in discussing the case of *Pelias berus*, suggests as an explanation of what has been observed, that possibly the young in their fright, against the mother's will, rush into her mouth as they would into any other opening that might present itself; and that once having entered the stomach they may either never leave it again alive, or they may act there as an emetic and be violently ejected! Now, Mr. Harvey states that his young snakes were accustomed, from their birth up to the time they were a month old, to pass freely into and out of the mothers' mouths. He does not know that they were ever all in the mothers' stomachs at the same moment, but sometimes three or four of them would be missing at once. Sometimes one would be seen going down the throat while another was coming out. Occasionally one might be seen with his head sticking out of one corner of the mother's mouth like a cigar, while in the other corner would be another's head or possibly tail. In describing the mother's movements, Mr. Harvey says, in a letter, that "the mother would sometimes lay her lower jaw on the floor, raise her upper jaw and with it her entire backbone, thus adjusting herself for them to play in and out. . . . They seemed to go in the full length of the stomach." When the young were about a month old they sloughed their skins, and after that event they were never observed to enter the mother's mouth, though they may have done so.

The maternal instinct must be very strong in these reptiles, usually regarded as so low in intelligence and so unfeeling, when they will for weeks and months endure hunger and thirst and still continue to care for their young. One might readily suppose that if the young ever entered the mother's stomach, the temptation would, under the circumstances, be almost irresistible for her to keep them there. When I first saw these specimens, about January 1, the old and most of the young were coiled up together as if for the purpose of keeping themselves warm. The heads of all the young ones were lying out on top of the coils, as if they were as desirous of seeing what was going on as are other young folks. One little one, however, was away from the others on the bottom of the box. One of the mothers appeared to take great interest in it, and kept rubbing it with her head and pushing it gently about with her snout. Mr. Harvey states that the mothers have been accustomed in various ways to show their affection for their young. "The mother would raise her head, turn it about and look over the young, place her nose against them, push them about, and pull them to her side."

The old ones have not shed their outer skins since their captivity began. Since they appear to change their dress twice a year, it is quite likely that this was accomplished just before they were captured. One young one who was watched got rid of his cuticle in about twenty minutes from the time that it was seen to be loose on his head.

Most of the young are quite dark in color, but all have plain indications of the rows of spots usually found in the species, and one has the ground color so pale that it closely resembles the young of the specimens found on the open prairies.